# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/734,228 | 12/11/2000 | Helmut Lucke | 450117-02965 | 5435 |

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| EXAMINER |
|---|
| JACKSON, JAKIEDA R |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2655 | |

DATE MAILED: 12/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| | | Application No. | Applicant(s) |
|---|---|---|---|
| **Office Action Summary** | | 09/734,228 | LUCKE, HELMUT |
| | | Examiner | Art Unit |
| | | Jakieda R Jackson | 2655 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on <u>09 August 2004</u>.

2a)☐ This action is **FINAL.**     2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) <u>1-13</u> is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-13</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All  b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

# DETAILED ACTION

## *Response to Amendment*

1.     In response to the Office Action mailed July 1, 2004, applicant submitted an

after-final amendment filed on August 9, 2004, in which the applicant requested

reconsideration with respect to **claim 1** and newly added **claim 13**.

## *Response to Arguments*

2.     Applicant amended claim 1 and added claim 13 to include the limitations of claim

8, which would have been allowable if rewritten in independent form.  However, after

further examination, applicant's arguments with respect to claims 1 and 13 have been

considered but are moot in view of the new ground(s) of rejection.

## *Claim Rejections - 35 USC § 102*

3.     The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by
another filed in the United States before the invention by the applicant for patent or (2) a patent
granted on an application for patent by another filed in the United States before the invention by the
applicant for patent, except that an international application filed under the treaty defined in section
351(a) shall have the effects for purposes of this subsection of an application filed in the United States
only if the international application designated the United States and was published under Article 21(2)
of such treaty in the English language.

4.      **Claim 13** is rejected under 35 U.S.C. 102(e) as being anticipated by Gorin et al.

(U.S. Patent No. 6,021,384), hereinafter referenced as Gorin.


As per **claim 13**, Gorin discloses a method for producing a low-perplexity

recognition grammar from a conventional grammar (column 2, lines 26-65) by

(a) identifying and extracting word classes (language models) of high-perplexity

(higher perplexity value) from the conventional grammar (column 2, lines 26-65);

(b) generating a phonetic, phonemic and/or syllabic description (word, symbol or

sound) of high-perplexity word classes (higher perplexity value), in particular by

applying a sub-word-unit grammar compiler to them (figure 2, element 210), to produce

a sub-word-unit grammar (words that follow) for each high-perplexity word class

(column 2, lines 26-65); and

(c) merging sub-word-unit grammars with remaining low-perplexity part of the

conventional grammar to yield said low-perplexity recognition grammar (lower perplexity

value).


5.      **Claim 13** is *alternately* rejected under 35 U.S.C. 102(e) as being anticipated by

Ehsani et al. (U.S. Publication No. 2002/0128821), hereinafter referenced as Ehsani.


As per **claim 13**, Ehsani discloses a method for producing a low-perplexity

recognition grammar from a conventional grammar by

(a) identifying and extracting word classes (trigram subsumed under the fixed collocation) of high-perplexity (very high perplexity) from the conventional grammar (column 5, paragraphs 0100-0102);

(b) generating a phonetic, phonemic and/or syllabic description (phone models and phonetic dictionary; column 11, paragraph 0217) of high-perplexity word classes (very high perplexity), in particular by applying a sub-word-unit grammar compiler to them (column 11, paragraphs 0211-0214 with column 10, paragraphs 0199-0200), to produce a sub-word-unit grammar for each high-perplexity word class (column5, paragraphs 0100-0102); and

(c) merging sub-word-unit grammars (combining) with remaining low-perplexity part of the conventional grammar to yield said low-perplexity recognition grammar (column 4, paragraphs 0064 with column 6, paragraph 0107).

## *Claim Rejections - 35 USC § 103*

6.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

7.      **Claims 1-5 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable

over Jiang et al. (U.S. Patent No. 6,539,353), hereinafter referenced as Jiang in view of

Ehsani.

As per **claim 1**, Jiang discloses a method for recognizing speech, comprising:

(a) the steps of receiving a speech phrase (100, FIG. 2);

(b) generating a signal being representative to said speech phrase using A/D

converter (102, FIG.2);

(c) using feature extractor for pre-processing and storing said signal (104, FIG.

2);

(d) generating from said pre-processed signal at least one series of hypothesis

speech elements (Col. 1, line 51-53);

(e) determining at least one series of words being most probable to correspond

to said speech phrase by applying a predefined language model to at least said series

of hypothesis speech elements (Col. 4, lines 13-16),

wherein the step of determining said series of words further comprises the steps

of:

(1) identifying a hypothesis string consisting of sub-word units (Col. 1, lines 52-55) then continuing determining words or combinations of words and which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase by using and evaluating additional and paired and/or higher order information between the sub-phrases, thereby decreasing the burden of searching (Col. 4, lines 33-44; inherently, N-gram method uses conditional probabilities, which are derived based on additional and paired information), but lacks identifying and extracting word classes of high-perplexity, applying a compiler and merging the sub-word-unit grammars with the remaining low-perplexity part.

Ehsani discloses phrase-based dialogue modeling method for producing a low-perplexity recognition grammar from a conventional grammar by

(a) identifying and extracting word classes (trigram subsumed under the fixed collocation) of high-perplexity (very high perplexity) from the conventional grammar (column 5, paragraphs 0100-0102);

(b) generating a phonetic, phonemic and/or syllabic description (phone models and phonetic dictionary; column 11, paragraph 0217) of high-perplexity word classes (very high perplexity), in particular by applying a sub-word-unit grammar compiler to them (column 11, paragraphs 0211-0214 with column 10, paragraphs 0199-0200), to produce a sub-word-unit grammar for each high-perplexity word class (column5, paragraphs 0100-0102); and

(c) merging sub-word-unit grammars (combining) with remaining low-perplexity part of the conventional grammar to yield said low-perplexity recognition grammar

(column 4, paragraphs 0064 with column 6, paragraph 0107), to measure the strength
of certain collocations.

Therefore, it would have been obvious to one of ordinary skill in the art at the
time the invention was made to modify Jiang's method wherein it identifies and extracts
word classes of high-perplexity, applies a compiler and merges the sub-word-unit
grammars with the remaining low-perplexity part, to measure for determining the
average branching factor of a recognition network, for evaluating language models
(column 5, paragraph 0100).

As per **claim 2**, Jiang et al. disclose the use of a language model (110, FIG. 2) to
provide additional information about the set of probabilities that a particular sequence of
words will appear in the language of interest (Col. 4, lines 33-44)

As per **claim 3**, Jiang et al. discloses the use of lexicon (108, FIG. 2) to further
limit the possibilities of word grouping when using the acoustic model (Col. 4, lines 24-
28).

As per **claims 4 and 5**, Jiang et al. discloses that language model (110, FIG- 2)
is a compact trigram model that determines the probability of sequence of words based
on the combined probabilities of three-word segment of the sequence. (Col.4, lines 41-
44). Inherently, trigram language models take prepositional relationships of sub-
phrases into account when calculating probabilities.

As per **claim 9**, Jiang et al. discloses the use of Hidden Markov Models for
estimating probabilities for any sequence of sub-words generated by lexicon (Col. 4,
lines 23-30).

8.    **Claims 6-7 and 10-12** are rejected under 35 U.S.C. 103(a) as being

unpatentable over Jiang in view of Ehsani, as applied to claim 1 above, in further view

of Chou et al. (U.S. Patent No. 5,797,123), hereinafter referenced as Chou.


As per **claim 6 and 7**, Jiang in view of Ehsani does not disclose the use of low-

perplexity and high-perplexity pads in the system.

Chou teaches limited vocabulary word spotting (low perplexity) with a parallel

network of subword models used to model the non-keyword portions of the input

utterance (high-perplexity) (Col. 2, lines 61-65). Inherently, sub-word models contain

word fragments.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify Jiang in combination with Ehsani's method, as

taught in Chou, in order to improve the speed of recognition by quickly identifying

commonly-used words using low-perplexity vocabulary and then proceeding to identify

the less-common words by resorting to more expansive computations.

As per **claim 10**, Jiang in view of Ehsani does not disclose the insertion of high-

perplexity word classes into hypothetic graph.

Chou teaches the insertion of functional words and filler phrases into the

detection network to improve recognition of key-phrases (Col. 6, lines 47-56).

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify Jiang in view of Ehsani's method, as taught in

Chou, in order to handle repeating speech patterns and thus speed up the search and improve recognition.

As per **claim 11**, Jiang in view of Ehsani do not disclose the removal of candidates from the hypothetical graph.

Chou teaches the merging of the of the states of the key-phrase network, thus reducing its size (Col. 7, lines 40-46).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang combination with Ehsani's method, as taught in Chou, in order to prune the passed nodes while doing the search through the hypothetical network and thus limit the possibility to accidentally encroach upon the beginning of another phrase.

As per **claim 12,** Jiang in view of Ehsani do not disclose restricting the remaining part of the key-phrase.

Chou teaches placing additional constraints on the search that inhibit impossible connections of key-phrases (Col. 6, lines 64-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang in combination with Ehsani's method, as taught in Chou, in order to improve the speed of recognition by quickly removing impossible combinations from the search graph and thus limiting the search space.

### *Conclusion*

9.     The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

- Wong (U.S. Patent No. 5,905,773) discloses an apparatus and method for

  reducing speech recognition vocabulary perplexity and dynamically selecting

  acoustic models.

- Brown et al. (U.S. Patent No. 6,587,822) discloses a web-based platform for

  interactive voice response (IVR).

- Lapere (U.S. Patent No. 6,272,463) discloses a multi-resolution system and

  method for speaker verification.

- Zingher (U.S. Patent No. 6,092,039) discloses symbiotic automatic speech

  recognition and vocoder.

- Tran (U.S. Patent No. 6,070,140) discloses a speech recognizer.

10.     **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of
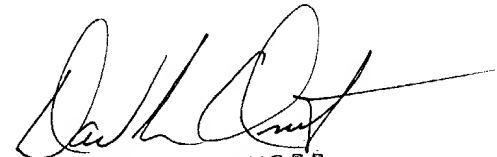
the advisory action.  In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jakieda R Jackson whose telephone number is

703.305.5593.  The examiner can normally be reached on Monday through Friday from

7:30 a.m. to 5:00p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Doris To can be reached on 703. 305.4827.  The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system.  Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov.  Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).


JRJ
December 2, 2004

DAVID L. OMETZ
PRIMARY EXAMINER